

7 WAYS COMPELLENT OPTIMIZES VMWARE SERVER VIRTUALIZATION

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compellent

INTRODUCTION

Increasingly, enterprises are turning to server virtualization to enhance IT flexibility while reducing costs. Server virtualization solutions such as VMware® Infrastructure software help to achieve those goals by abstracting applications from physical resources. With VMware, administrators can run multiple applications on the same physical machine. As a result, VMware helps increase resource utilization, accelerate the provisioning of new applications, simplify server management and improve disaster recovery.

The Compellent® Storage Center™ storage area network (SAN) is a perfect complement to the VMware environment because virtualized storage offers significant and complementary benefits to virtualized applications. By creating a pool of virtual storage volumes, the Compellent SAN provides the flexibility to change or move storage attributes without affecting how storage is presented to the server. The Compellent SAN reduces the overall storage capacity needed to support a VMware environment, speeds up storage provisioning, simplifies storage management, enhances disaster recovery and reduces the cost of acquisition, operation and management.

Like the VMware environment, the Compellent SAN abstracts storage attributes from physical hardware. Storage is presented to virtual servers as disk capacity, regardless of the mix of disk types, disk capacities and server connectivity selected by administrators. As a result, administrators have the same sort of flexibility in making changes to virtual storage volumes as they do with virtual machines (VMs). They can change RAID levels, storage tiers and server connectivity without changing how storage is presented to servers.

By using VMware and the Compellent SAN together, enterprises can compound the benefits of virtualization. This paper addresses the following technical advantages and describes how they allow the Compellent SAN to optimize VMware server virtualization:

1. Thin Provisioning Conserves Storage Capacity
2. Automated Tiered Storage Maximizes VM Storage Performance and Efficiency
3. Server Instant Replay Minimizes the Capacity Needed for VM Clones
4. Automatic LUN Masking Accelerates VM Storage Provisioning
5. Intuitive Interface Simplifies VM Disaster Recovery
6. Cost-Effective Replication for VMware Site Recovery Manager
7. A Persistent Hardware Architecture Delivers Hardware Flexibility

1. Thin Provisioning Conserves Storage Capacity

The proliferation of virtualized servers can put a serious strain on storage capacity requirements. The Compellent SAN avoids that strain by implementing multiple innovations to reduce hardware requirements while maximizing the benefits of the storage infrastructure. The initial layer of simplification and optimization begins with Compellent's Thin Provisioning capability, which separates storage allocation from utilization. While administrators can create storage volumes of any size for virtualized applications, physical capacity is consumed only when data is written to the disk. With Thin Provisioning, IT groups can avoid having to purchase excess capacity up front. When an application requires more storage, the system provisions more from the pool of unused capacity. Thin Provisioning creates an on demand storage environment. For instance, Thin Provisioning can present 10 virtual storage volumes, 1TB each, for use by 10 unique VMs, but only require the physical capacity that is actually written.

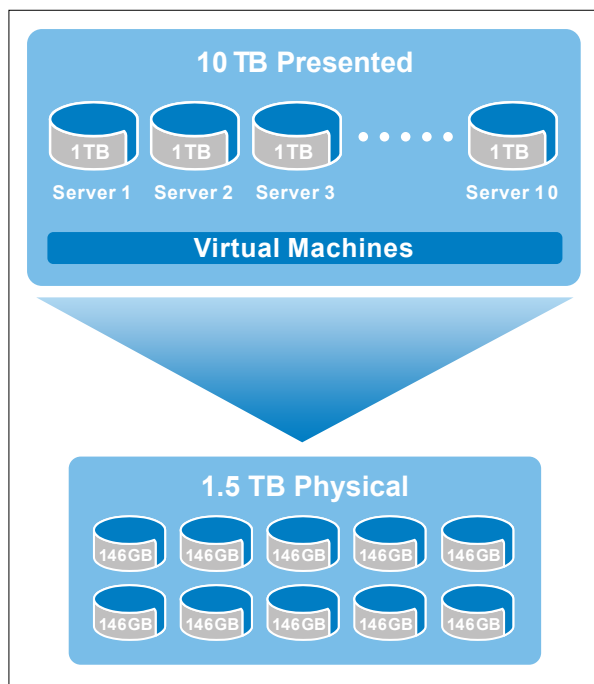


Figure 1. *Thin Provisioning allows allocation for future volume growth, without physical utilization.*

2. Automated Tiered Storage Maximizes VM Storage Performance and Efficiency

Compellent's Automated Tiered Storage, called Data Progression, can help optimize the use of storage for a VMware environment. Data Progression dynamically classifies and moves block-level data between tiers of storage based on the frequency of data access. It reduces the need for high-performance, high-cost disks by moving infrequently used data to less-expensive media while also ensuring that frequently accessed blocks remain on the fastest drives.

With a traditional VMware storage environment, administrators might place high-performance VMs on tier 1 storage, medium-performance VMs on tier 2 and low-performance VMs on tier 3. Administrators would then use the VMware Storage VMotion capability to move VMDK files between LUNs as storage needs change.

With the Compellent SAN, Data Progression manages data at the block level, within the volume and VMDK, classifying and moving block-level data automatically based on usage. The result is a self-tuning Datastore that makes more efficient use of disk resources than traditional storage environments. And because data is classified and transferred automatically, and optimization is ongoing, Data Progression greatly reduces administrative burdens.

While Data Progression optimizes data placement between tiers, the Fast Track feature optimizes data placement within each tier. By placing the most frequently used data on the fastest, or outer, tracks of each drive, Fast Track helps reduce seek times for the most active blocks of data while also minimizing the number of drives required to manage data overall.

3. Server Instant Replay Minimizes the Capacity Needed for VM Clones

The Compellent SAN's Server Instant Replay™ software further reduces the capacity required to support a VMware virtualized environment while accelerating application recovery. Server Instant Replay is particularly useful in reducing the storage space needed to support clones (or copies) of VMs. Administrators might need to create a clone of a VM to facilitate software testing, provide distinct operating environments for multiple users or help protect VMs by storing a backup at a disaster recovery site. Yet creating a full clone, which is a completely distinct copy of the parent VM, is time-consuming and can use up excessive storage space.

By using Server Instant Replay, administrators can create space-efficient Replays (snapshots) of VMs without duplicating all of the allocated storage space. Administrators can then use the Replay as they would a full clone. Server Instant Replay writes only the block-level data that has changed from the parent VM. Because the Replay volumes write only those “delta” block-level changes from the original VM, the resulting VM deployments consume up to 75 percent less space. With Server Instant Replay, administrators can

clone individual boot RDMs (raw device mappings) or an entire VMFS (virtual machine file system) Datastore.

Server Instant Replay also speeds up the process of recovering VMs when clones are used as part of a disaster recovery scheme. Using Server Instant Replay, administrators create space-efficient Replays of VMs at the disaster recovery site. In the event of a problem with the original VM, administrators can power up a spare server, point it to the Replay on the SAN and boot up. The VM is back up and running in minutes.

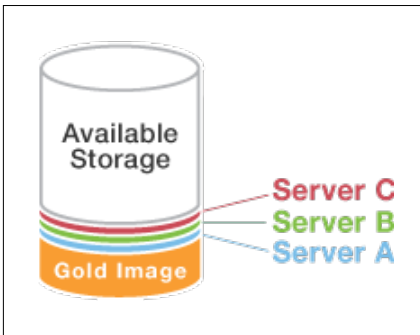


Figure 2: *Server Instant Replay requires only small amounts of space for each additional server boot image.*

4. Automatic LUN Masking Accelerates VM Storage Provisioning

Just as VMware helps save time in deploying new applications, the Compellent SAN's automatic LUN masking capabilities simplify and accelerate storage provisioning for virtual servers while also helping to avoid the possibility of human error during the provisioning process. With traditional SANs, administrators must conduct LUN masking manually for each

REDUCING COSTS WITH VMWARE AND COMPELLENT

“Our environment is 90 percent virtualized using VMware technology. We estimate that the cost savings that we’ve received by implementing the Compellent SAN is about a 20 percent reduction in infrastructure costs for both equipment and staff.”

TODD CROY
Infrastructure Manager
Scott County

“We saved over \$70,000 in server upgrades and reduced our energy usage by 80 percent by combining Compellent and VMware.”

KEVIN FITZPATRICK
IT Director
ROEL Construction

server-storage connection. That process is time-consuming and potentially error-prone. One server could be mapped accidentally to the wrong storage, interrupting availability.

Because the Compellent SAN pools all disks together and allocates capacity across disks, there is no need to create disk groups or go through the manual LUN masking process. All disks are available to all hosts. Automatic LUN masking also reduces ongoing administrative time by eliminating the need to record, track and manage LUN masking assignments.

5. Intuitive Interface Simplifies Management and Replication

The Compellent SAN's Enterprise Manager delivers the same kind of centralized simplicity of the VMware management console, VMware vCenter Server. While SANs from other vendors use separate applications for provisioning storage, creating snapshots, recovering applications, replicating data and other functions, Compellent's intuitive interface enables administrators to manage nearly all the Compellent SAN functionality from a single, easy-to-use interface. Where traditional SAN interfaces require administrators to go through the time-consuming manual process of setting up dozens or hundreds of LUNs for virtual servers, Compellent's wizard-driven set up can greatly simplify and accelerate that process.

Enterprise Manager, Compellent's storage resource management software delivers some particularly powerful benefits to administrators setting up, testing and running disaster recovery with VMware environments. With Compellent's Enterprise Manager, administrators can set up volume replication for disaster recovery in about 30 seconds, with six clicks, through an easy-to-use wizard.

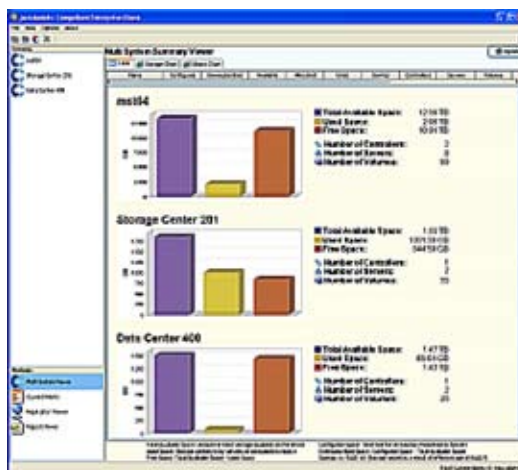


Figure 3: Easily manage multiple SANs from a single interface.

6. Cost-Effective Replication for VMware Site Recovery Manager

The Compellent SAN replicates highly efficient Replays between local and remote sites over IP networks, providing SRM-based Disaster Recovery at a fraction of the cost of other replication solutions. VMware SRM automates the recovery process, automatically failing over to the disaster recovery site and ensuring reliable recovery. The Compellent SAN communicates with VMware SRM via a Storage Resource Adapter, importing VMs and powering them up in a predefined order. Administrators can test disaster recovery regularly and make sure that when recovery is necessary, VMs come back online in the order that makes the most sense to the business.

Compellent's integration into VMware's SRM enables full non-disruptive validation of recovery plans within an isolated testing environment without risk of disrupting production. Enterprise Manager also helps speed up recovery. With traditional SANs, administrators might need to prepare each storage volume for the VMware environment during the recovery process. But with Enterprise Manager, administrators can predefine the disaster recovery site and complete the mapping ahead of time, eliminating the tedious work of mapping volumes by hand, rescanning and making sure all disaster recovery systems are running. In the event of a problem, administrators using Enterprise Manager can activate recovery for multiple VMware servers from a remote site with a single click, using VMware's Site Recovery Manager and Compellent's SRA.

In addition to providing key benefits for disaster recovery in a VMware environment, Enterprise Manager offers detailed reporting that helps administrators identify trends among VM volumes and plan for future storage needs. For example, administrators can ensure that fast-growing VM volumes will have sufficient storage available over the months or years to come. Administrators can also track port traffic and disk usage to better balance server loads and improve budgeting and resource planning.

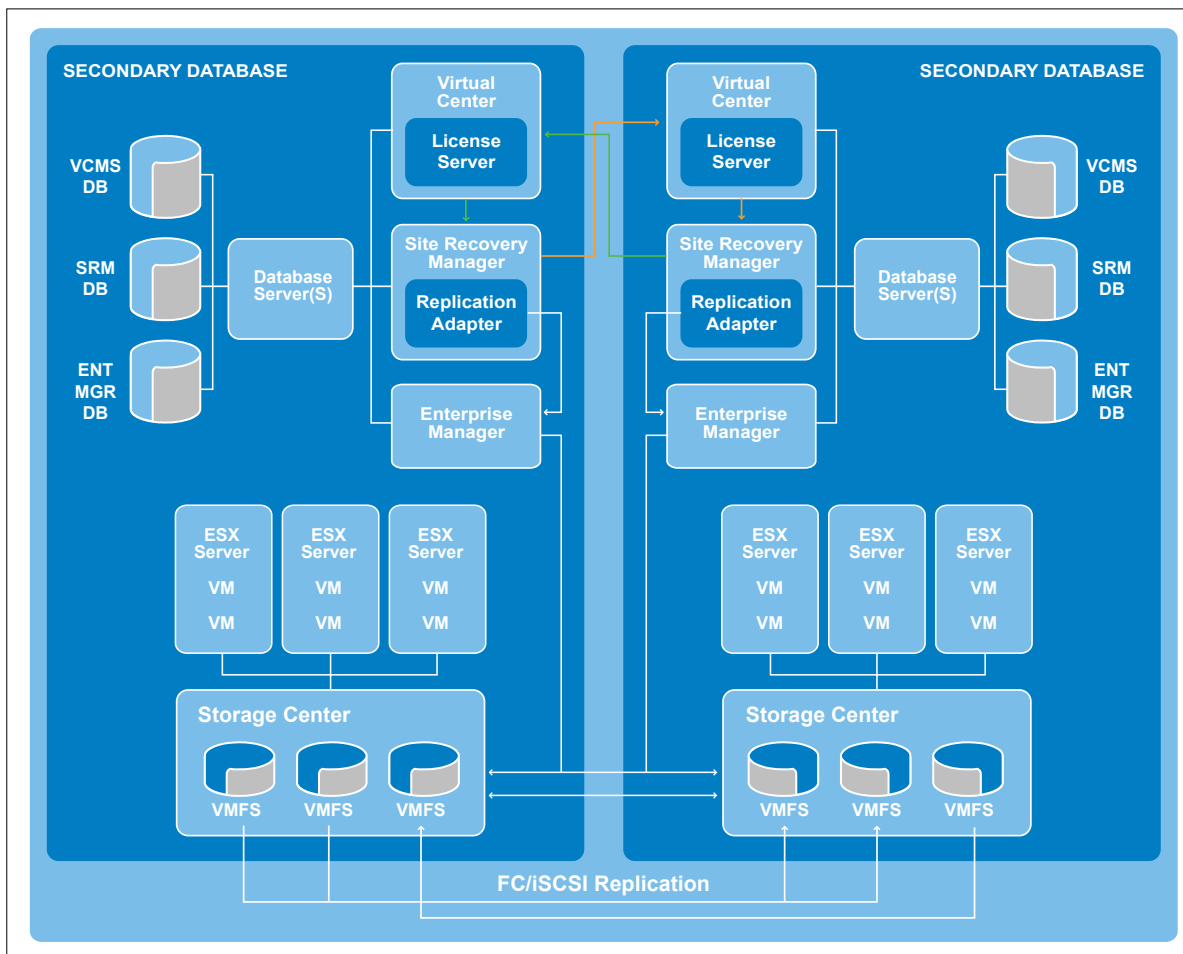


Figure 4: Compellent's integration with VMware SRM delivers non-disruptive recovery.

7. A Persistent Hardware Architecture Delivers Hardware Flexibility

The Compellent SAN's persistent hardware architecture provides the ultimate flexibility for a virtualized data center. Other SAN vendors rely on proprietary hardware designs, impose restrictions on the types of technology that can be used and prohibit customers from mixing and matching different drive and interconnect technologies. As a result, these products enter premature obsolescence and force their customers into costly forklift upgrades.

The Compellent SAN is designed for persistence, not obsolescence. Using an open, nonproprietary hardware architecture, the Compellent SAN enables businesses to continuously integrate new disk drive, switch and network interface technologies without having to replace existing hardware or software. Enterprises can use any combination of Compellent's standards-based hardware options and connectivity platforms to provide the greatest level of choice while delivering the flexibility, scalability, availability and investment protection that businesses require.

By enabling enterprises to use multiple hardware options and connectivity platforms simultaneously, the Compellent SAN helps administrators optimize the balance of performance and cost for the VMware server infrastructure. As a VMware performance study has shown, Fibre Channel storage can frequently deliver better throughput, latency and CPU efficiency than iSCSI storage. Yet the study also showed that iSCSI connectivity can nevertheless deliver excellent performance for many applications while also providing clear cost advantages. With the Compellent SAN, enterprises do not have to choose one platform or the other. Instead, they can create a flexible storage environment that capitalizes on both the performance of Fibre Channel and the cost advantages of iSCSI connectivity.

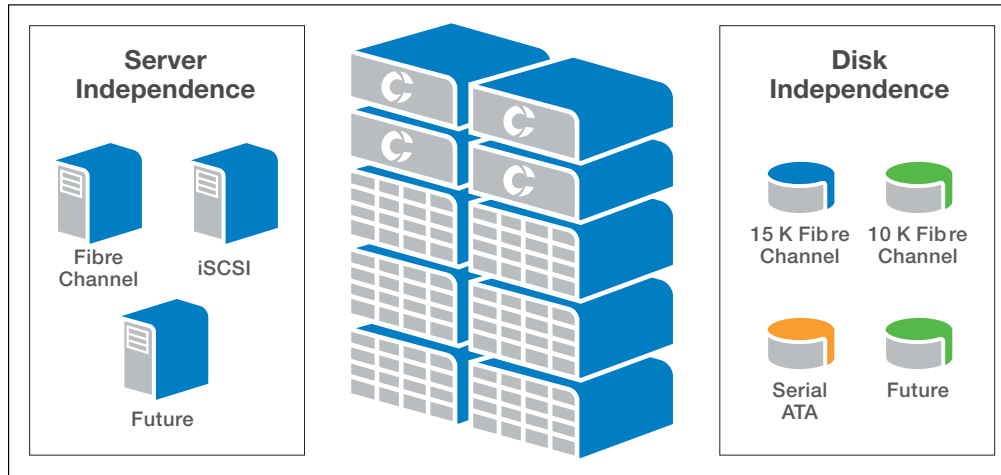


Figure 5: *The Compellent SAN provides technology independence designed for persistence not obsolescence.*

CONCLUSION

Creating a virtualized storage infrastructure with the Compellent Storage Center SAN enables enterprises to amplify the benefits of VMware server virtualization. With the Compellent SAN, administrators can reduce the storage capacity needed for a virtualized server environment, accelerate storage provisioning, simplify management and improve disaster recovery. Several of Compellent's industry-leading features, including Server Instant Replay, Data Progression and Compellent's SRA plug-in for SRM, can provide VMware users unique advantages not found in traditional SANs. By pairing the Compellent SAN with VMware software, enterprises can optimize a VMware infrastructure to achieve the flexibility for business change while significantly reducing infrastructure costs.

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